#### Vapster-Diesel RV-4400 Installation Guide For Duramax Diesel Engine (6.6 L)

#### Please Read Entire Instruction Guide before Attempting to Install Your Vapster-Diesel Product



#### Installation should be completed by a Certified Vapster-Diesel Mechanic or a competent Diesel Mechanic

This instruction guide will give step by step instructions on installing the Vapster-Diesel RV-4400 Fuel Saver Catalyst System on the above mentioned diesel engine. Please have the vehicle you are doing the installation on base-lined before installation. Conduct a standard testing procedure with protocol so you can repeat the same tests to see results once the unit is installed. GMC states the average highway mileage on a 2007 Silverado 2500HD with automatic transmission is estimated to be 18 m.p.g. When the Vapster-Diesel RV-4400 is installed you should see fuel mileage gains into the low 20's m.p.g. for the highway. We recommend using a "Scan Gauge" if you do not have live computer readouts with your vehicle.

Note: You should read the instructions completely to make sure you have the tools, the fasteners, clamps, and hoses to complete the installation. Safety is very important both during the installation and after the installation. Your Vapster-Diesel product has been designed with safety, durability, and trouble-free performance in mind. Therefore, proper installation is important for the system to function properly and remain maintenance-free. You will be working with diesel fuel, engine coolant, and fuel lines. It is important to follow the installation procedures with safety in mind. It is recommended to have a fire extinguisher in the immediate vicinity when completing the install. It is recommended that you wear safety glasses and mechanic's gloves for eye and skin protection.

#### Items Below Which Are Included in the Kit

- A) (6) Heater hose clamps for the 5/8 inch heater hose
- B) (4) Fuel hose clamps to fit the 1/2 inch X 3/8" coupler to the fuel line
- C) (2) Fuel line Reducer couplers 1/2" X 3/8"
- D) (2) ABS heater hose couplers 5/8" X 5/8"

E) (2) Brass 3/8" hose barb X 1/4" NPT fittings to connect fuel line hose (Already Installed on Unit)

F) (2) 5/8 inch X 3/8" NPT Hose barbed Brass fittings to connect heater hoses (Already Installed on UNIT)

G) (2) Cushioned Brackets to hold the Vapster-Diesel Unit in Place

H) (1) One Vapster-Diesel Unit pretested for leaks and compatibility to your engine.

# Items Which Are Not included in the Kit and must be purchased before installation:

- A) (1) Gallon of fresh antifreeze engine coolant or 50/50 mixture of engine coolant
- B) (6) Plastic zip ties to secure fuel line and/or heater hose
- C) (1) Plastic catch can for spilled coolant/fuel
- D) A quart of diesel fuel

#### Items Which ARE Optional and Can be shipped with the Kit at the Customers Request:

A) Approximately 9' of 5/8 inch heater hose (depends on existing circulatory hoses going to and coming from the heater core). Available from most Auto Parts Stores

B) Approximately 7.5' of 3/8" fuel line hose. Does not have to be fuel injector hose. Recommended is Gates Push On or Parker Push On Hose. Comes in Blue, Red, and Black colors. Regular fuel line is Available from most Auto Parts Stores. The Gates Push On or Parker Push On Hose can be found at Performance Stores or Hydraulic Shops.

Note: The "Vapster-Diesel" unit comes with an Installation Kit to help with the installation procedure. The install kit comes with most everything you need except for the <u>heater hoses</u> and the <u>fuel line hoses unless the customer's request</u>. See picture below for items included in the install kit. Some items may already be installed on the Vapster-Diesel unit. The Vapster-Diesel unit, hoses and cushioned bracket's are not shown in the photo.



Illustration 1: Installation Kit Tools Required

2 Crescent wrenches 5/16" and ¼" nut drivers 2 Flat-faced "Vise-Grips" Utility knife or hose cutter A set of mechanics tools Plastic funnel Catch can for any leaking fuel or coolant Shop towels Safety Goggles Mechanic's Gloves



**Tools Required For Installation** 

#### **Installation Steps**

There are three Basic Steps in the Installation Process: A) Install the Unit, B) Connect the fuel lines, and C) Connect the Heater/Coolant Lines.

**A-1** The first step is to install the unit. The fundamental premise of the installation is to locate the best suitable location in the engine compartment. Some basic rules of location are: a) locate the Vapster-Diesel Unit close to the fuel filter/water separator as possible, b) allow enough room to connect the fuel lines and heater hoses to the Vapster-Diesel unit, c) avoid being close to any part of the exhaust system, d) avoid contact with any electrical wires or in the vicinity of any wires they may chaff on the Vapster-Diesel housing. From previous installs we recommend installing the unit on the driver's side behind the serpentine belt of the air conditioning compressor. A picture is included to show the location on a 2007 Silverado Duramax 6.6L engine.

# Important Note: Before attaching the fuel lines and heater hoses to the Vapster-Diesel unit make sure you have all the fittings, clamps, and hoses required to complete the installation process.

**A-2)** After finding a suitable location to install the unit following the above rules secure the cushioned mounting brackets that were included with the product. You can use the two <u>Perforated Steel Strap</u> mounts to secure the two rubber cushioned brackets included with the Vapster-Diesel Unit. There are two bolts included with the kit to secure the <u>Perforated Steel Straps</u> in place. If the perforated mounts do not fit you can fashion mounts from Aluminum Flat plate 1" X 1/8" X 24" from Home Depot. You can cut, bend, and drill the flat plate to custom make your mounts.



Hold Down Mounts Bolted to Drivers Side of Engine

**A-3)** After the hold down mounts are secured you want to bolt the cushioned brackets in place. Place the 3/8" inch stud attached to Cushioned Bracket and pass it through one of the perforated holes and tighten. Do the same with the other mount.



**Cushioned Mounts Attached to the Perforated Mounts** 

Once the Cushioned Brackets are in place open the brackets so you can place the Unit inside. Weather stripping can be added to the outside of the unit so the cushioned brackets fit snuggly. The fuel fittings should be pointing to the left or the passenger side of the engine

compartment. Also, the two 5/8" brass fittings on top of the unit for the heater hose should be facing back towards the firewall.



**Unit Mounted in the Cushioned Brackets** 

It is not necessary to completely tighten the Cushioned Mounting Brackets at this point in the installation process. You may want to make minor adjustments to the angle of the Unit when completing the fuel line and heater hose hook-ups. With the Vapster-Diesel unit resting in the brackets it will be necessary to measure the lengths of the heater hose and fuel lines that will be needed to complete the installation. Note: Make sure you have space to be able to remove the cap to the power steering pump to the right and below the unit.

**B-1)** The next step is to measure and install the fuel lines from the fuel filter/water separator to the Vapster-Diesel Unit. To measure the fuel line hose required you will need to remove the Air Intake Hose from the end of the air filter box to the beginning of the Turbo Intake. First remove the three-wire harness from the <u>Mass Air Flow Sensor</u> by pushing down on the little plastic lever and wiggling the three-wire pigtail from the housing. Next loosen the screw bands at <u>Both</u> ends of the <u>Air Intake hose</u> with a 5/16" nut driver. This should allow you to remove the plastic air intake hose. The intake hose is narrower at the turbo end and wider near the air filter box.



Air Intake Going to Turbo Has to Be Removed

**B-2)** With the air intake hose removed you should be able to see the <u>fuel filter/water</u> <u>separator</u> unit (See Photo Below). Follow the  $\frac{1}{2}$  inch fuel line coming out of the top of the fuel filter canister on the right side. There is a arrow pointing out which is stamped on top of the housing. You should see about 12 inches of fuel line from the edge of the fuel filter leading back to the driver's side of the engine going to the injector pump.



Fuel Filter Assembly Showing Outlet Hose on the Right

**B-3)** Find the middle distance of this  $\frac{1}{2}$ " fuel hose leading from the fuel filter canister, mark it, and make sure you have enough room on either side of this measurement so you can easily secure a coupling fitting  $\frac{1}{2}$ " X  $\frac{3}{8}$ " to each end of the hose once you cut through it.

(<u>This special coupling is included in the Kit</u>). Measure the total distance from this marked spot on the  $\frac{1}{2}$ " fuel line to the 3/8" brass fitting on the Vapster-Diesel unit (Always allow a little extra in your measurements for the fuel line hose). It is easier to trim excess then to be short on the run distance of the hose. Once you have the measurement for one run (the 3/8" fuel line hose measurement going to one side of the Vapster-Diesel unit to the  $\frac{1}{2}$ " fuel line (coming from the fuel filter) go ahead and cut the measured section of 3/8" fuel line hose to fit this run. On one end of the 3/8" fuel line hose place the reducer coupler fitting and secure with hose clamp. Lay the cut 3/8" fuel hose with coupler fitting attached near the  $\frac{1}{2}$ " fuel line which has not been cut yet and follow the other end of the 3/8" fuel line hose to the 3/8" barbed fitting on the unit. The new fuel line hose you marked earlier and make a straight cut through the hose with a utility knife or hose cutter. Let the fuel drain into the catch can until it is completely drained. Remove the catch can so it does not spill. Push the  $\frac{1}{2}$ " fuel line hose leading away from the fuel filter canister and secure with screw clamp.



Photo Showing Fuel Line Spliced with the Reducer Coupler

**B-4)** Now do the same with the other open cut end of the  $\frac{1}{2}$ " fuel line hose leading to the injector pump. Secure the second reducer coupler into the second  $\frac{3}{8}$ " fuel line hose with a screw clamp and measure from the cut end of  $\frac{1}{2}$ " fuel line hose to the  $\frac{3}{8}$ " brass hose barb fitting on the Vapster-Diesel unit. Double check your measurement before cutting the last section of the  $\frac{3}{8}$ " fuel line hose. Now secure the  $\frac{1}{2}$ " side of the coupler/reducer into the loose end of  $\frac{1}{2}$ " fuel hose and secure with a screw clamp. Before securing the other end of the fuel line to the Vapster-Diesel unit you will need to bleed the air from the unit. Start the bleeding by filling the Vapster-Diesel Unit with <u>Diesel Fuel</u>. You can use an Ear Suction Bulb from a local drug store. Place a little diesel fuel in a clean short container and use the Ear Suction Bulb to draw up fuel and place into one of the brass fittings connecting the  $\frac{3}{8}$ " fuel line on the fuel end of the Vapster-Diesel unit. Continue to draw fuel and fill up the Vapster-Diesel unit.

Diesel unit until fuel comes out of the other fuel fitting on the Fuel end of the Vapster-Diesel Unit. (See Photos Below).



Adding Diesel Fuel to Bleed the Air from the Unit using an Ear Suction Bulb



Draw Diesel Fuel From a Clean Container Using an Ear Suction Bulb

Once the Vapster-Diesel Unit is full of Diesel fuel tighten the fuel lines on the end of the Vapster-Diesel unit. Next loosen the bleed screw (Black Plastic Screw) on top to the primer pump/fuel filter canister. Press several times on the plunger on top of the fuel filter assembly and allow the air to escape from the bleed screw forcing the air from the fuel lines. Continue this procedure until only fuel comes out of the bleed screw. Tighten the bleed screw and pump several times until pressure builds up on the plunger. This procedure

should force the air from the fueling system. This should complete the fuel line hose circuit to the unit.

### Note: The reduction of the fuel line from $\frac{1}{2}$ " to $\frac{3}{8}$ " back to $\frac{1}{2}$ " does not affect the performance of the engine.

**C-1** The final step of the installation process is to install the 5/8" heater hose lines from the heater core to the inlet and outlet ports of the Vapster-Diesel unit. With the air intake hose removed you should be able to see the heater hose coming from the top of the engine (coming from a silver colored box on the passenger side of the engine) going to the heater core on the firewall. The length of hose exposed should be about 12 inches. Find the middle of this length of hose and mark for cutting. After isolating this section of heater hose take the two flat faced "Vise-Grips" and clamp on either side of the section you are going to spice. Place a catch can under this area of the hose before you cut using a sharp bladed utility knife or a hose cutter. Using this method you should lose only a minimal amount of engine coolant. Cut the hose making sure you have a firm clasp on each side of the cut with the flat faced "Vise-Grips". See the photo below.



**Cutting heater hose & Vise Grips to Stop Coolant Draining** 

**C-2** Make sure you have enough hose on either side of your mark to be comfortable with installing the ABS 5/8" X 5/8" coupling fitting. Clamp the two Vise-Grips down to flatten the heater hose so only minimum amount of coolant is lost. Place the ABS connector in one end of new heater hose and secure with a screw clamp. Now cut the hose and place the new heater hose with the connector attached into one end of the cut hose. Using a lubricant such as Lithium grease or Vaseline helps push the new hose over the barbs. Secure with a screw clamp. Feed the new heater hose around the back of the engine or you can come around the front of the engine which ever direction works best to arrive at one of the 5/8" hose barbs on the new unit. It does not make a difference which one hose barb you attach

to. When you are satisfied with the run and the length of the new hose placement you can cut the far end and place over the hose barb on the unit and secure with a clamp. Take the remaining new heater hose and do the same thing with the other cut hose coming from the truck's heater hose circuit. Place the ABS 5/8" X 5/8" connector on the end of the new heater hose and secure with a screw clamp. Place this new ABS connector into the remaining cut hose from the truck's heater hose circuit with the Vise-Grip attached and secure with a screw clamp. Feed this second new heater line back over to the remaining 5/8" barbed fitting on the unit. When you are satisfied with the run (to the front or the rear of the engine) to the second hose barb go ahead and cut the hose. Place the cut end over the barb and secure with a screw clamp. **Note:** Make sure there are no tight turns in the heater hose circuit that would kink the heater hose and restrict the coolant flow.



#### Top View and Drawing of Typical Installation Fig. 5

Reference numbers affiliated to drawing: [Fuel lines to the engine] (10) fuel tank, (40) fuel filter/water separator, (22) Vapster-Diesel Unit (This unit will be on the opposite site with a Duramax 6.6 L engine), (61) Fuel Injector Pump [Fuel lines back to the fuel tank] (12) Return Fuel Lines, (55) Overall engine, (30) Radiator, (33) Air Intake

[Other aspects of the installation] (21) Engine thermostat, (62) Diesel Injectors, (20) Heater Core, (15) Engine Water Coolant Return Line, (155) Coolant Hose originally going to heater core now spiced to flow in and out of the Vapster-Diesel Unit, (7) Coolant Hose exiting Vapster-Diesel and returning to the heater core (20).



Installation of heater Hoses to the Vapster-Diesel Unit

C-3 Note: This should complete the coolant circuit to the Vapster-Diesel unit. Place the clean drained coolant into the coolant fill tank or top of the radiator. Your circuit will require additional coolant to be added after start up.



**Complete Installation of the Vapster-Diesel Unit** 

Important!!!! Purge all the air from the fuel lines and the Vapster-Diesel unit before trying to attempt to start the engine.

# Important!!!! Make sure all fuel lines and hose clamps are secure and tightened.

Add coolant before starting engine. Start the engine and let the engine run for several minutes. Check for any coolant leaks and/or diesel fuel leaks.

Make sure all fuel lines and coolant lines are secure. Make sure the device is secure. Let the engine warm up, shut off, check coolant level again, and restart engine.

Check for any check engine lights or tripped engine codes. Check again for any fuel leaks or coolant leaks. If found, identify, and fix before driving the vehicle on the roadway.

You can drive the vehicle at this time to check for drivability and check engine lights. There should be no problems.

# Congratulations! You are now ready to road test the vehicle and get better fuel mileage.

Note: After driving several short trips, check for leaks, if found, fix them. Once the thermostat opens up you will need to add more coolant.

AFTER INSTALLATION TIPS:

1. Some engines will require the computer to be reset. If the fuel mileage reverts back to baseline the computer will have to be reset. This can be accomplished by removing both ground cables from the batteries for at least 25 minutes. When the time has elapsed reconnect the battery cables and make sure the connections are snug.

2. If the usage of the fuel saver device is in colder weather (below 50 degrees F.) the fuel saving unit and hoses leading to and from the device should be insulated for better efficiency. The fuel saver will lose efficiency when the ambient air temperature drops 55 degrees and lower.